

P.T.W. New Version Motor (Development of the PF-490 Motor) Commentaries



PF-490 MOTOR

High Cycle with High Output

TYPE-A

High Trque with Energy Saving

TYPE-B

1. Process of 490 type Motor development.

Describing the development of our new type Motor I would sum it up as a revolutionary new version introducing well over 85% changes to our pre-existing motor parts. The vast majority of the improved performance know how employed in this new motor came about from our development of our very popular Magnum and Turbo motors. We also felt it very important to focus on reinforcing the pre-existing motor. The P.T.W. is quite different from Tokyo Marui's Motor design in that for TM, their grip was designed around the motor, meanwhile in the case of the P.T.W. the Motor, Grip, and all of the internal components were researched and developed to work cohesively as one complete functioning unit. In other words, despite designing a motor that would fit in a small grip we never consider that as a negative; quite the opposite we envisioned creating a high quality motor that would fit in a grip that feels as comfortable as a grip used in a real firearm. Our conventional 480 Motor had already come close to our goal; however our new motor has taken it one step further and added a few new points.

Furthermore, this new motor utilizes two variations of rotors which yields High Cycle with High Output (New Type) as well as High Torque with Energy Saving Properties (Primarily for training purposes), each of which was developed for the intended purposes.

Introducing one example of product type A (which features a High Cycle / High Output), using an M170 spring it is capable of 22 cycles per second (with a 12V 2400mAh battery).

On the other hand, our High Torque / Energy Efficient Type B is capable of discharging well over 5200 rounds in one single charge (with our P.T.W. 9.6V 1600mAh battery and with an M90 Cylinder Unit).

At this point I would like to explain about the details of our new motor.

2. Characteristics of our 490 type motor.

1. Dimension changes of the bearing insertion points for the rotor.

Although we go through well over 200,000 bearings each year, we take caution in handling each and every bearing. Because the demand for our motors generally requires a higher than normal cycle rates our high voltage motors involve a greater precision in assembly. In our current design we reduced the pressure fit of the bearing case by half from our conventional bearings to allow for easy maintenance of the bearing after insertion. Simply changing the dimensions of the bearing set may seem a bit modest of an improvement, however upon researching this we realized the importance of modifying this component for the sake of performance; the compilation of the miniature ball bearings require a high level of judgment.



2. Support of the rotor by three bearings.

Addition of motor base side rotor bearings

As previously mentioned, after experiencing a high level of performance, we felt it important to focus on minimizing oscillation as the rotor from the P.T.W. Motor is longer than a conventional motor; hence we added an additional bearing to the support rotor. There are a total of three bearings supporting the rotor, as the rotor emits a unique resonance during spin the bearings act as a buffer maintaining peak performance.

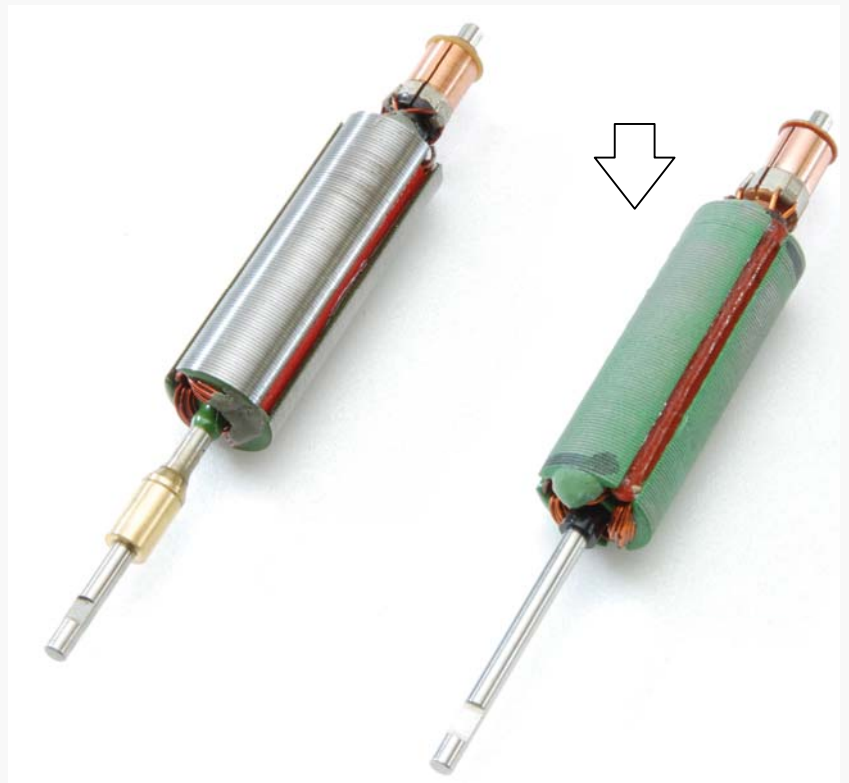
3. The Motor Case (magnet case) materials and changes to the dimensions.

As stated earlier, the P.T.W. motor requires a great deal of strength. As such we decided to utilize a Stainless Made Magnet Case. We realized that it was a bit disadvantageous as compared to iron; we decided to go with SUS430 which has an adequate amount of magnetism. With this case we not only improved the overall strength of the motor but also improved upon the balance of the rotor spin.



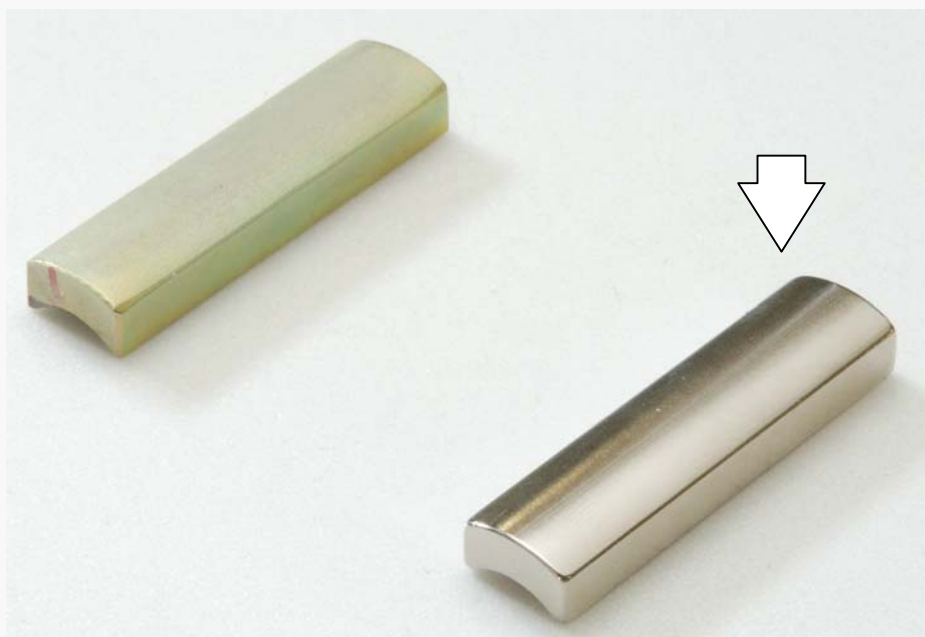
4. New Production Rotor

The heart of a motor is its rotor. One of the big characteristics with this new motor is; in comparison with the previous motor we went with one size larger of the core piece (from 15.6mm OD to 16mm). Furthermore, the press fit manufacturing method was improved for the shaft of the core piece to reduce stress. To ensure proper spin balance great care was taken in the process of the hand wound rotor; please verify its performance.



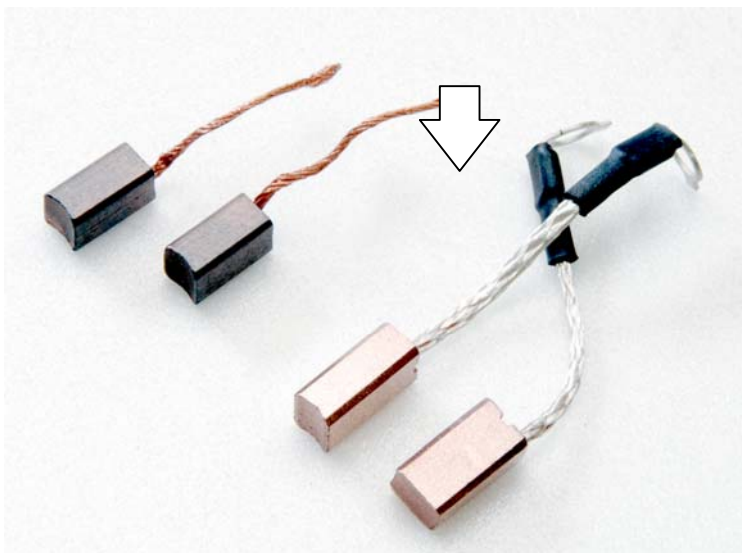
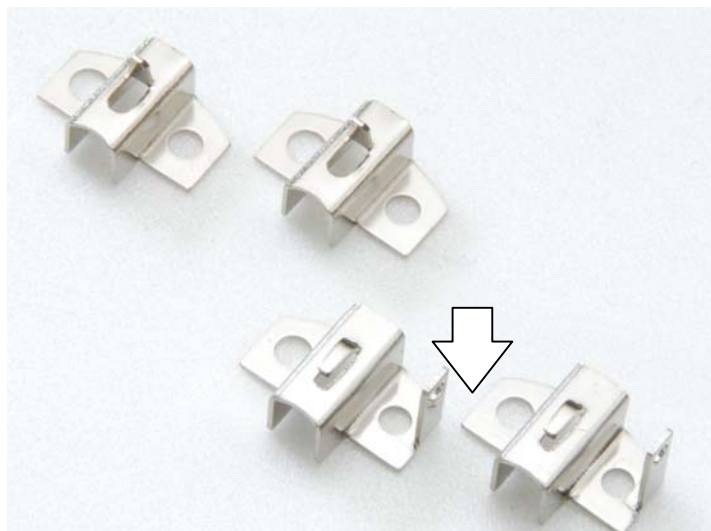
5. Implementation of a new version magnet.

I believe that there are many people who already understand that it is the Neodymium Magnet in our MAGNUM motor that has the biggest influence in regards to performance. The magnet in our new motor is an even stronger magnet than that. Unlike TM's methods, the P.T.W. motor is completely adhered to either side of the grip which becomes disadvantageous in regards to heat dissipation. Although the magnetic strength of the Neodymium magnet is very strong one weakness is in its effect in performance in presence of heat. We focused our research and decided to use an exclusively heat resistant magnet.



6. Implementation of a newly-designed brush case

The conventional brush case was made by brass and was subject to a lot of stress when the cord was pulled thus cause warping. Even a difference of 1/100mm is not allowed when installing the brush with the brush case. Therefore we adopted stainless steel for the case materials and also raised the hardness by adding thickness to the material to improve upon the overall strength. To prevent fusion of the solder due to excessive heat, we opted to use a pressure connection of the terminals. (Pressure terminal connections are not used for the M733). To improve on the external electric resistance, the case utilizes chrome plating in the final process of assembly.



7. The adoption of Carbon Brushes

With the application of the above mentioned case, it became possible to utilize Carbon Brushes that have a 25% improved contact surface. Furthermore, our new version brushes utilize non-oxidized copper mesh wires with pressure connected terminals. In this way this new motor is capable of effectively securing electric current thus producing a balance between efficiency and high performance.

In conclusion, placing importance in quality and high performance in a small motor, we focused our research in size along with the pursuit of the very best in excellence; and now we present the one and only motor, the PF-490.

It is in products such as this that we take pride in expressing our commitment to our clients.

We thank you for your continued support in our ever evolving P.T.W.

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